

1. Rate measurements, including temporal and spatial variations, of freshwater drainage from various land uses around Albemarle-Pamlico waters are required for many of the same reasons that riverine inflows are needed. The effect of land use, artificial drainage, channelization, and water-control practices on drainage to estuarine waters will allow better informed management of land use conversion activities and management of existing drainage systems.
2. Effects of freshwater drainage, from both altered and natural areas, on the salinity regime of receiving waters may be used to evaluate the effect of existing drainage outlets, to manage pumped-drainage systems and to better protect important nursery areas.
3. Identification of lands and nursery areas of significance and areas which would suffer major adverse effects from drainage activities, along with a solid basis from which to evaluate the effects of drainage on receiving waters, is also vital to the protection of aquatic living resources.
4. If areas of ecological or economic significance are found to be adversely affected by drainage activities, mitigation of the effects or restoration of altered lands may be an option. Information on expected benefits of such mitigation/restoration activities, plus the cost of mitigation/restoration, will allow more informed decisions to be made.
5. Effects of a single land use conversion or drainage activity within a small area on receiving waters are certainly difficult to quantify. Yet, management decisions require information on the net, or cumulative, effect of numerous small, individual changes on overall receiving water quality.
6. Global climate change and the related sea-level rise are topics of intense scientific speculation and discussion. Because of the low elevations and flat terrain of the Albemarle-Pamlico shoreline, sea-level rise would have a dramatic effect on the entire estuarine system, including freshwater drainage processes.

In Back Bay, Virginia, there has been concern over the local (and usually short-term) effects of the saltwater pumping operation at Little Island, a project that was designed to have counteracted the effects of the construction of a line of dunes (the dunes have successfully prevented overwash events from occurring for nearly 20 years, and so have altered the salinity of Back Bay). A significant saltwater plume, however, was produced, the adequate dispersion of which was dependent upon wind-driven tides, and the flushing regime of the Bay was altered. Operations of the station were recently brought to an end in the midst of much controversy over the desired character of the waterbody.

A. 1. c. Estuarine Transport Issues. Riverine inflows and local drainage waters are mixed by hydrodynamic and transport processes within the estuary. These processes also directly or indirectly affect, among other things, the re-suspension, transport, and deposition of sediments, advection and mixing of dissolved substances, exchange of oxygen and volatile organics across the air-water interface, the formation and movement of algal blooms, and the movement of the larval stages of several fish and shellfish species.

In general, estuarine transport rates cannot be determined directly except over a small area for a short period of time. The usual procedure is to measure tidal elevations, wind speed and direction, inflow rates, and the upstream and downstream salinity variation over time. These data are utilized, along with information about bathymetry, to compute transport rates throughout some region of interest. Short-term measurements of velocity fields may be used to insure that the computations provide reasonable results for the conditions under which the measurements were made.